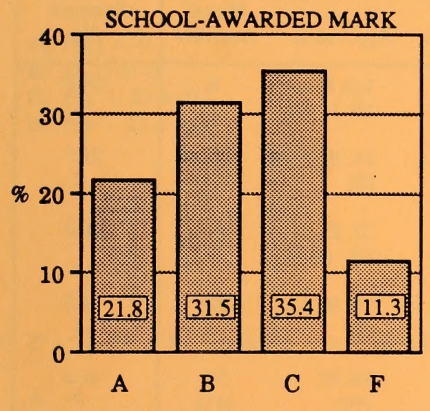
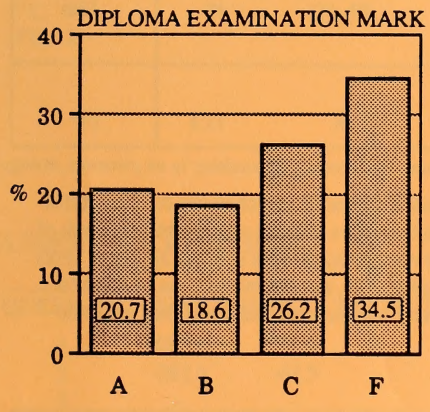
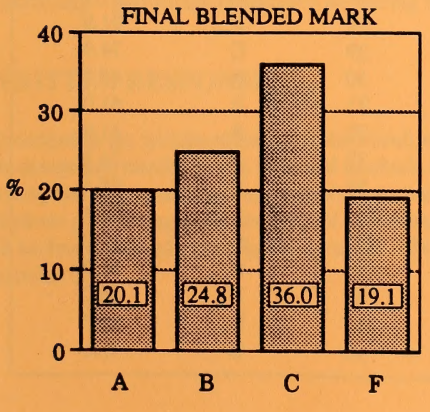
Mathematics 30 Diploma Examination Results







The summary information in this report provides teachers, school administrators, students, and the general public with an overview of results from the June 1991 administration of the Mathematics 30 Diploma Examination. The information is most helpful when used in conjunction with the detailed school and jurisdiction reports that have been mailed to schools and school jurisdiction offices. An annual provincial report containing a detailed analysis of the combined January, June, and August results will be available in the fall of 1991.

DESCRIPTION OF THE EXAMINATION

The Mathematics 30 Diploma Examination consists of three parts: a multiple-choice section of 40 questions worth 61.5%, a numerical-response section of 12 questions worth 18.5%, and a written-response section of three questions worth 20% of the total examination mark.

ACHIEVEMENT OF STANDARDS

The information reported is based on the final blended marks achieved by 10 278 students who wrote the June 1991 examination.

- 80.9% of these students achieved the acceptable standard (a final blended mark of 50% or higher).
- 20.1% of these students achieved the standard of excellence (a final blended mark of 80% or higher).

While a high percentage of students achieved excellence in Mathematics 30, an increased number of students failed to meet course standards. Overall, students continued to have difficulty applying their mathematical knowledge.

PROVINCIAL AVERAGES

- The average school-awarded mark was 66.2%.
- The average diploma examination mark was 59.4%.
- The average final blended mark, representing an equal weighting of the diploma examination and school-awarded marks, was 63.2%.

Alberta
EDUCATION

RESULTS and EXAMINERS' COMMENTS

SUBTEST

When analysing any detailed examination results, please bear in mind that subtest results **cannot** be directly compared.

Results are in average raw scores.

Machine scored: 31.8 out of 51

Written response: 6.1 out of 13

- Course Content
  - Trigonometry: 9.7 out of 15
  - Quadratic Relations: 7.8 out of 14
  - Sequences, Series, Limits: 7.2 out of 13
  - Statistics: 5.2 out of 8
  - Logarithms: 3.8 out of 6
  - Polynomial Functions: 4.3 out of 8
- Cognitive Levels
  - Knowledge: 3.3 out of 5
  - Comprehension: 11.1 out of 17
  - Application: 19.6 out of 34
  - Higher Mental Activities: 3.9 out of 8

EXAMINATION BLUEPRINT

Each question on the examination is classified in two ways: according to the curricular content area being tested and according to the cognitive level demanded by the question. The examination blueprint illustrates the distribution of questions in June 1991 according to these classifications. Numbers with square brackets [ ] indicate written-response questions, those with round brackets ( ) indicate numerical-response questions, and those without brackets indicate multiple-choice questions.

Reporting Category	Questions by Cognitive Level				Examination Emphasis (%)
	Knowledge	Comprehension	Application	Higher Mental Activities	
Trigonometry	7	3, 4, 5, 13, (1), (2)	1, 2, 6, 8, 10, 11, 12	9, (3)*	24.6
Quadratic Relations	18	15, 16, 20, (4)	14, 19, 21, [3]	17, (5)	21.5
Sequences, Series, Limits	27	24, 25, (6)	22, 23, [2], (7)	26	20.0
Statistics	(9)	29, 33	28, 30, 31, (8)	32	12.3
Logarithms		34	36, 37, (10)	35, (11)	10.8
Polynomial Functions	38	(12)	39, [1]	40	10.8
Examination Emphasis (%)	7.7	27.7	50.8	13.8	100

*Numerical-response question 3 was deleted because the wording led students to an incorrect strategy.

The examination has a balance of question types and difficulties. It is designed so that students capable of achieving the acceptable standard would obtain a mark of 50% or higher and students capable of achieving the standard of excellence would obtain a mark of 80% or higher. Future examinations will require students to combine an understanding of mathematical concepts, an ability to apply procedural skills, and complete accuracy to receive full marks. Greater emphasis will be placed on the communication of students' understanding of mathematical concepts and procedures. Students will need to achieve these learner expectations if they are to be successful on the examination.

MULTIPLE CHOICE

QUESTION	KEY	DIFFICULTY*	QUESTION	KEY	DIFFICULTY	QUESTION	KEY	DIFFICULTY
1	B	77.9	14	A	71.3	27	D	47.9
2	D	79.0	15	A	69.1	28	B	91.9
3	C	90.3	16	C	76.9	29	C	74.9
4	B	55.7	17	A	41.2	30	A	45.7
5	A	84.3	18	D	58.2	31	B	61.0
6	C	65.6	19	B	64.3	32	B	41.0
7	D	67.2	20	C	58.5	33	A	74.3
8	C	57.8	21	A	65.5	34	B	78.4
9	A	76.9	22	B	90.2	35	C	59.1
10	B	47.5	23	D	75.2	36	D	57.9
11	D	41.4	24	A	45.5	37	C	51.7
12	D	51.3	25	A	72.1	38	B	86.0
13	C	55.8	26	C	42.3	39	D	66.7
						40	D	46.6

*Difficulty – percentage of students answering the question correctly

MULTIPLE CHOICE (continued)

Students were expected to achieve the acceptable standard on all knowledge and comprehension questions — those questions that required students to apply one concept. Many students met this expectation; however, knowledge and comprehension questions comprised only 35% of the examination. Students achieving the standard of excellence were expected to demonstrate a thorough knowledge of mathematics and to apply this knowledge to new situations. Questions 9, 17, 26, 32, 35, and 40 required students to apply their knowledge of mathematics to a new situation. Illustrative questions follow:

38. If $x + 2$ is a factor of the polynomial function $P(x)$, then

A. $P(2) = 0$
*B. $P(-2) = 0$
C. $P(x + 2) = 0$
D. $P(x - 2) = 0$

Question 38 required students to identify the relationship between the factor and zero of a polynomial function. Of the students who wrote this examination, 86% were able to recognize this relationship and correctly identify the correct response. Close to three-quarters of the students who did not meet the acceptable standard were able to identify the relationship on this knowledge level question. Written-response question 1 also required this knowledge in order to begin a strategy to solve the problem, and yet 47.2% of all students were not able to transfer this knowledge to an application situation.

39. If $x^4 + 2x^2 - 1$ is divided by $x + 1$, then the remainder is

A. -4
B. -2
C. 0
*D. 2

To solve **question 39**, students could have used a number of methods: long division of polynomials, synthetic division, or the Factor Theorem. Three-quarters of the students who achieved the acceptable standard and one-half of the students who did not meet the acceptable standard were able to use one of these methods to identify the correct answer on this application level question. As in question 38, the knowledge used to answer question 39 was required to respond to written-response question 1.

NUMERICAL RESPONSE

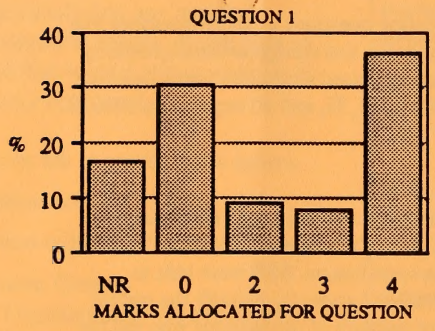
QUESTION	KEY	DIFFICULTY*	QUESTION	KEY	DIFFICULTY	QUESTION	KEY	DIFFICULTY
1	002.6	72.3	5	023.2	28.5	9	025.5	68.7
2	082.1	47.5	6	356.4	68.8	10	001.9	75.9
3	–	–	7	153.0	59.2	11	009.5	56.9
4	010.4	41.0	8	021.0	58.7	12	006.0	40.2

*Difficulty – percentage of students answering the question correctly

WRITTEN RESPONSE

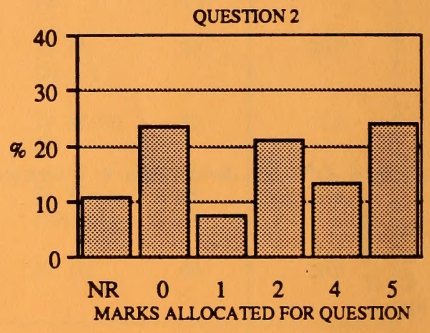
Questions in the written-response section dealt with three of the six content strands for Mathematics 30. Students performing at the acceptable standard were expected to obtain at least half marks on all questions. The marks assigned for analytic skills and conceptual understanding were combined such that not all scores between one and five for any given question were possible. Students performing at the standard of excellence were expected to answer all questions almost perfectly. However, 47.2% of all students received no marks for question 1, 34.6% received no marks for question 2, and 17.6% received no marks for question 3.

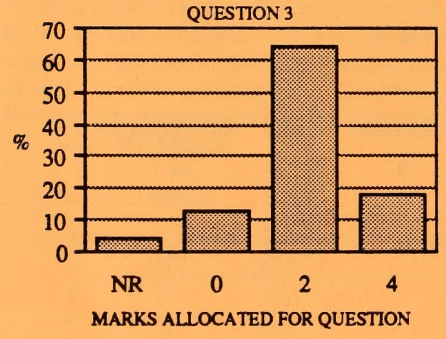
WRITTEN RESPONSE (continued)



Question 1 required students to recognize the relationship between the x-intercept of the graph of a polynomial function, the factors of the polynomial function, and the zeros of the polynomial function. It was expected that students would be able to achieve at least 50% on this question. Only 36% of the students were able to recognize this relationship. Approximately 17% of the students were able to start a solution and carry through to identify the relationship between the zeros and the factors of the polynomial function. Although the majority students were able to choose the correct solution in the multiple-choice section of the examination, they were not able to begin to solve the problem in the written-response section. On this 4-mark question, the average mark was 1.86 or 46.5% of the available mark.

Question 2 required students to write an expression for the second term in an arithmetic sequence and the second term in a geometric sequence. Students were then asked to identify the relationship between the geometric sequence and the arithmetic sequence. It was expected that students would have no difficulty responding to the first part of the question but would have some difficulty identifying the relationship between the two sequences. We did expect that students would be able to recognize that a relationship exists. Only 20.9% of the students were able to write an expression for the second terms in both the arithmetic and geometric sequence. These students then had difficulty in recognizing the relationship between the two sequences; 13% of the students were able to write the expression for the second terms in the sequences and recognize the relationship. On this 5-mark question, the average mark was 2.21 or 44.2% of the available mark.





Question 3 required students to write the equation of a circle and the equation of a parabola. The last part of the question required students to identify the value of x for the points where the circle and the parabola intersect. We expected that students would have no difficulty on the first two parts of this question but would experience some difficulty on the last part. Overall, students were able to identify the equation of a circle and a parabola on the multiple-choice section of the examination. In the written-response section of the examination, 17.6% of the students were not able to begin a solution to this problem, 64% of the students were able to identify an equation for either the circle or the parabola but could not identify the value of x for the points where the circle and the parabola intersect, and 18.4% of the students were able identify the equations for both the circle and parabola and then determine that these two graphs do intersect. On this 4-mark question, the average mark was 2.02 or 50.5% of the available mark.

Note: Overall, markers have noticed that more students are explicitly explaining their work. This should continue to be encouraged as we move to students' descriptions of mathematical concepts and problem solving.

For further information, contact Florence Glanfield, Yvonne Johnson, or Phill Campbell at the Student Evaluation Branch, 427-2948.